JULY 1962
40 CENTS

Communication HORIZONS

MICROWAVE SERVICING — PAGE 4

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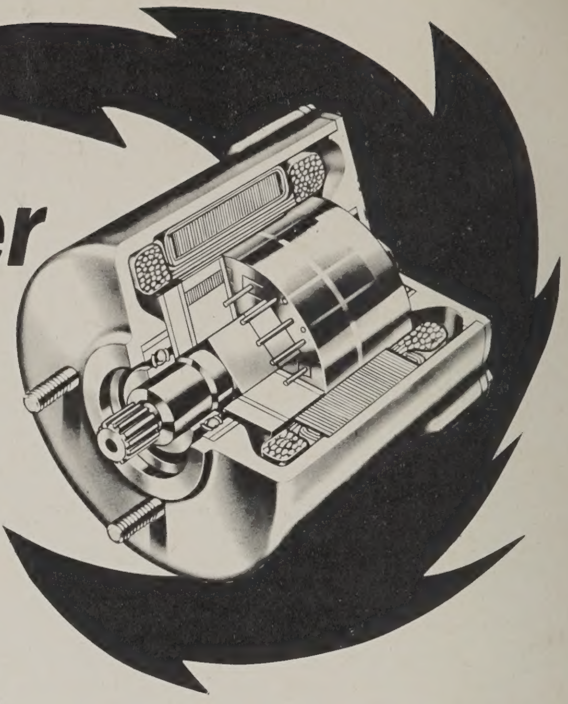

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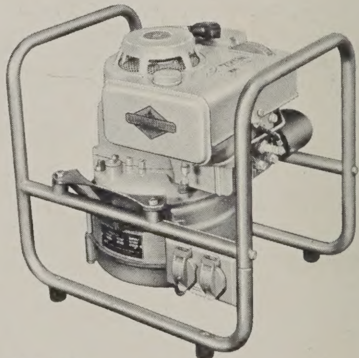

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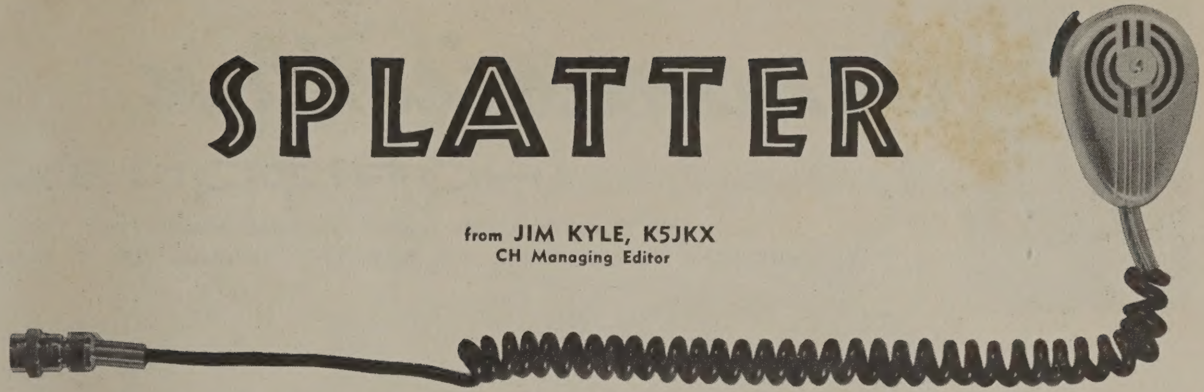

from JIM KYLE, K5JKX
CH Managing Editor

Gad, what a month! In addition to putting a few more touches on our new look and getting out the first issue of a new magazine (VHF Horizons, in case any of you happen to be hams interested in the VHF-UHF region too), we took time out to visit the big Parts Show in Chicago.

Biggest emphasis in Chicago was on entertainment, military, and hobby fields; non-broadcast radio found few new developments there—but the din from hi-fi speaker manufacurers demonstrating their wares made it interesting anyhow (especially the one with a stereo recording of fire engines answering a three-alarmer — ever try to dodge a pumper in the halls of the Conrad Hilton?) and there *were* a few new items for the communications industry.

For instance, Hammarlund had their Outercom monitor receivers on display, and Johnson was demonstrating their new Tone Alert (described in detail in CH Showcase this month). Rohn had a new lightweight crank-up tower which looked perfect for mounting on the back of a truck to run coverage surveys.

But as we said, the developments for us communications people were scarce—and who could expect otherwise at a show aimed primarily at disributors?

Things will be a bit different this December in Disneyland, at the 13th annual National Technical Conference sponsored by the PGVC, IRE. This event — as you undoubtedly already know — is aimed right at us, by us, for us; and *that's* where we can expect to find out what's new. Put the date down on your calendar: December 6 and 7.

Except for the quadriannual change of Commissioners, politics and communications radio usually stay far apart. It came as a bit of shock to find out that even the FCC has gotten into the investigating act in the first scandal of the current administration.

But there they are, investigating the affairs of one Billie Sol Estes, right along with everyone else. Seems that an Estes firm—The Farmers Co.—has applied for a Special Industrial license; and newspaper accounts have it that the firm was using the radio equipment—sans license—to direct changing of serial numbers of mortgaged fertilizer tanks.

The Commission explained that before it can grant an application, it must consider "any evidence" of unlicensed operation. While inquiring if the published reports were true, the Commission also asked Estes if he has any other licenses, and if he subscribes to a common carrier domestic public service.

Wonder if we could get the fellow who thought up the ingenious cotton-allotment-transfer idea to find us some stray frequencies? We need 'em!

Had a nice note from Jack Darr the other day. Jack, in case the name doesn't light up neons in your memory, is the author of "Two-Way Mobile Radio Maintenance" and a number of other books published by Howard W. Sams, as well as being the conductor of a TV-industrial service column in Radio-Electronics magazine. He has hung his shingle in Mena, Ark., since 1935, and has been writing since 1947.

Along with the note Jack sent a copy of another of his books, "Television Antenna Handbook." While the title might sound far, far removed from anything of interest here, it's not. This little epic —of which Jack says "It's my pet"—contains possibly the only complete discusion of tower erection, installation, and guying now in print. The instructions are complete—even to a section on "How to fall off a roof." At $3.95, nobody who installs any sort of antenna pole or tower should be without a copy!

And there's just a chance you might see a squib or two from Jack himself in these pages. Want it? Let me know!

jk

JULY 1962
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CONTENTS

Sy-Pep Paper **4** Microwave Servicing
Unusual Usage **8** Radio-Controlled Turnpike
System Report **10** Reliability in Richmond
Public Safety **12** Complete Communications
Late News **14** FCC Names Board
Bob Tall Reports **16** Our Man in Washington

DEPARTMENTS

1 Splatter
15 Logbook
19 CH Showcase
20 Milestones

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OUR COVER:

Microwave technicians find themselves faced with a maze of complex-looking equipment — but the most complicated thing about it is the plumbing. Leo G. Sands (author of many books on all fields of communications) tells you about it beginning on page 4.

ADVERTISING

Communication Horizons Magazine accepts commercial display advertising from bona fide manufacturers and distributors of communications equipment and associated apparatus. Advertising rate card and coverage data available upon request. Call collect area code 405 CEntral 2-1108 for advertising information.

CIRCULATION

Communication Horizons Magazine is read monthly by nearly 10,000 two-way communication engineers, technicians, installers and users. Detailed circulation breakdown available upon request.

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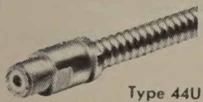

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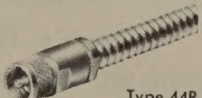

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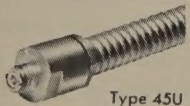

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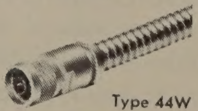

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Microwave

by Leo G. Sands

TO GET INTO microwave servicing, as an employee or as an independent service contractor, is not difficult. You probably already have a First or Second Class Radiotelephone Operators License. Technical information about microwave equipment may be obtained from equipment manufacturers' instruction books. (Don't expect to get them free unless a manufacturer is already planning to use your services. Since these books are large and costly to prepare, you may have to pay a nominal amount for them).

Another excellent source of basic information is a book entitled "Microwave Radio Relay Systems." available from the Rome Air Force Depot, Rome, N. Y. It is identified as T. O. 31R5-1-9.

There are many excellent texts on microwave principles, but they are of value mostly to the equipment and system design engineer. The service technician is not concerned with design, but should be well grounded in fundamentals.

960-MC Systems

There are only a few basic types of microwave equipment. For short-haul, low channel density systems, 960-mc band equipment is widely used. A 960-mc band terminal consists of a superheterodyne FM receiver with crystal controlled oscillator, a multi-stage crystal controlled FM transmitter and a power supply, as illustrated in Figure 1. Separate antennas and frequencies are used for transmitter and receiving.

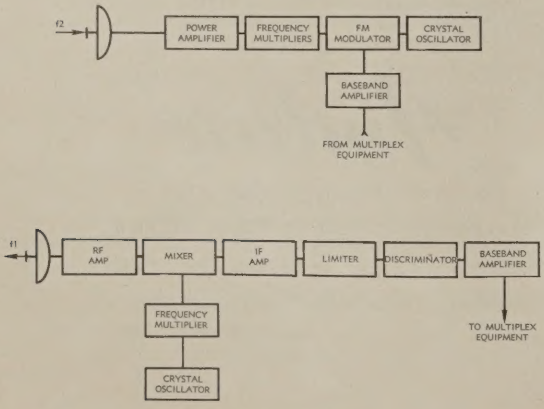


Figure 1. 960-mc Terminal

This kind of a terminal is essentially like a mobile radio unit, except for operating frequency and the fact that transmission and reception take place simultaneously.

2000-MC Systems

A 2000-mc band microwave terminal is similar in circuitry. However, the higher operating frequency and wider possible separation of transmit and receive frequencies permit use of the same antenna for transmitting and receiving

A 960-mc or 2000-mc repeater may be formed by connecting transmitters and receivers back-to-back as shown in Figure 2. Or, a heterodyne repeater may be used. A block diagram of a heterodyne repeater is shown in Figure 3.

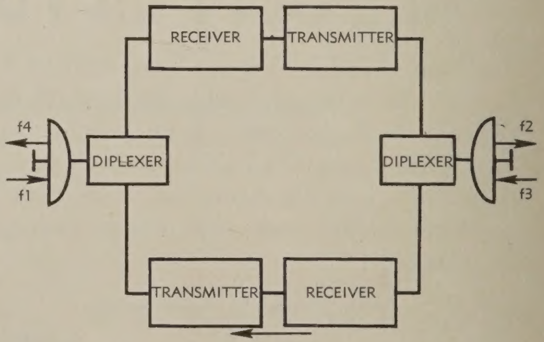


Figure 2. Back-to-Back Repeater

6000-MC Systems

Most long-haul microwave systems operate in the 6000-mc band. Equipment for this band is more expensive but less complex than 2000-mc band equipment. A single antenna is used for simultaneous transmission and reception, and waveguide instead of coaxial cable is used for feeding the antennas. Long waveguide runs can be avoided by using passive reflectors, as shown in Figure 4, to direct the beam in the desired direction.

6000-MC Transmitters

A 6000-mc band microwave transmitter is a simple device employing a self excited reflex kly-

Servicing

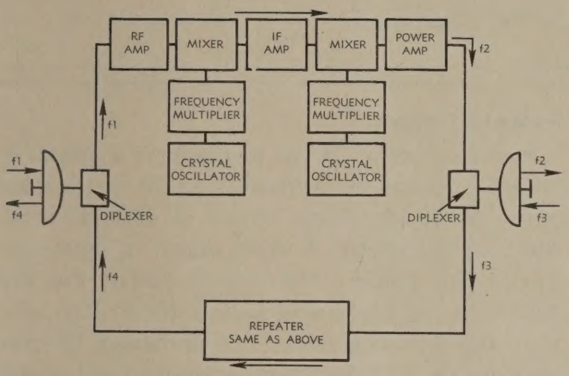


Figure 3. Duplex Heterodyne Repeater

stron oscillator. The transmitting frequency is determined by the physical characteristics of the klystron cavity and by the value of the klystron repeller voltage. The transmitter is kept on frequency by regulating the temperature of the klystron, by mechanical adjustment of the cavity, or by automatic (AFC) adjustment of the repeller voltage.

The klystron is frequency modulated, as shown in Figure 5, by applying the modulating signal through an amplifier to the klystron repeller. The klystron frequency is deviated about ± 1 mc from the assigned carrier frequency in a typical 120 to 240 channel system. Wider deviation is employed in a 600-channel TV transmission system.

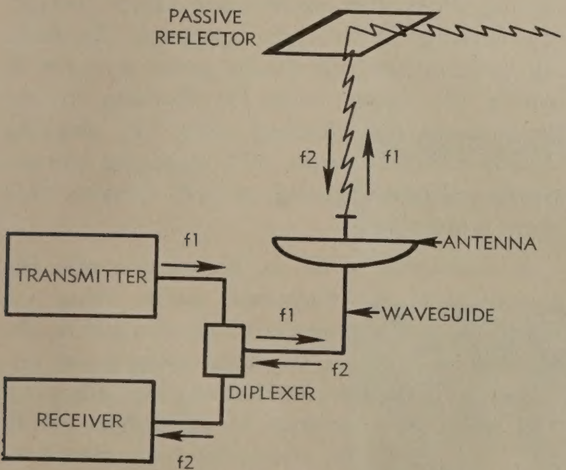


Figure 4. Use of Passive Reflector

6000-MC Receivers

A 6000-mc band receiver employs a superheterodyne circuit and a klystron local oscillator, as shown in Figure 6. The incoming microwave signal beats with the local oscillator signal in the crystal mixer, producing an IF signal, usually 70-mc or 90-mc. This beat signal is fed through a broadband IF amplifier which drives limiter stages. The FM signal is demodulated by a discriminator whose output is fed to a baseband amplifier.

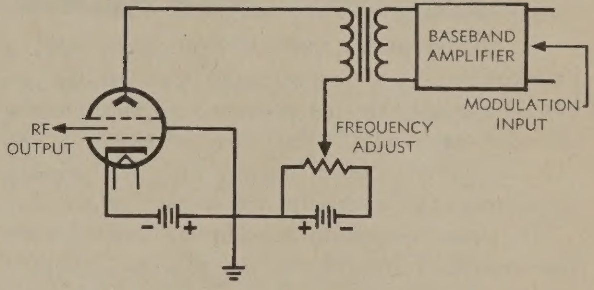


Figure 5. Simplified Schematic of Klystron Transmitter

The receiver is kept on frequency by an AFC circuit. The local oscillator klystron repeller voltage is automatically regulated to maintain the correct local oscillator frequency by the AFC signal voltage from a discriminator. Or, the AFC signal is used to control a mechanical device which adjusts the klystron cavity.

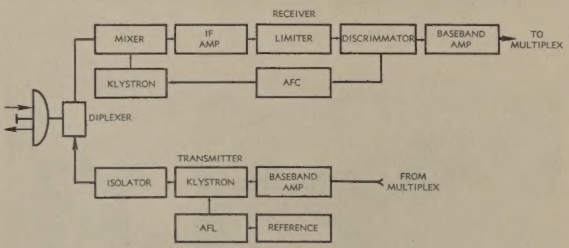


Figure 6. 6 or 12 KMC Terminal

The power supply must furnish high negative voltages for both klystrons and lower positive voltage for the other tubes, as well as filament voltages. Until recently, power supplies operated from a-c. Now, most microwave equipment is equipped with power supplies operable from a 24- or 48-volt d-c source. Transistors are used for d-c to a-c conversion and solid-state rectifier diodes for conversion of the a-c to d-c at the required voltages.

The latest types of microwave equipment utilize transistors and diodes in lieu of tubes except for the transmitter and receiver klystrons. Even the local oscillator klystron in the receiver is about to be replaced in some equipment by a solid-state, crystal controlled, frequency multiplier employing transistors and varactor diodes. Within a few years, the transmitter klystron may be replaced by a solid-state frequency multiplier. At the present time, the power output of these devices is inadequate at 6000-mc.

Standby Equipment

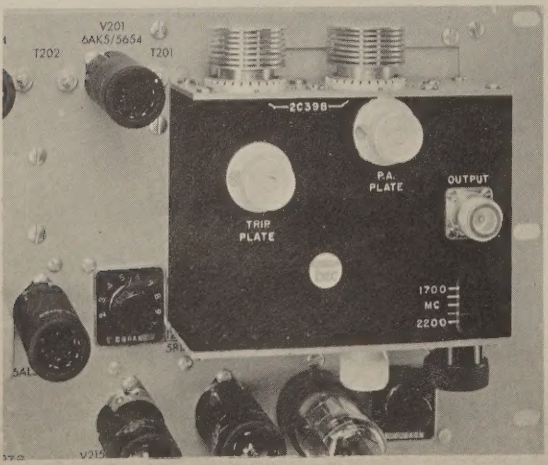
Typically, two transmitters and two receivers are utilized at terminals. One is normally used; the other is a standby, ready to function when the primary unit fails.

In the event the primary equipment fails, a waveguide switch automatically transfers the antenna system from the primary equipment to the standby equipment. Relays also switch the multiplex input and output circuits from the primary equipment to the standby equipment.

In some equipment, transmitters and receivers are switchable individually instead of as a complete transmitter-receiver set. Also, ferrite switches are sometimes used in lieu of electro-mechanical waveguide switches for antenna transfer. Sometimes both receivers are connected to the antenna at the same time, their outputs being fed into a baseband combiner which utilizes both signals or the better of the two.

12,000-MC Equipment

Equipment for the 12,000-mc band is essentially the same as 6000-mc band equipment except for the microwave plumbing and klystrons used.



2 KMC RF Power Amplifier

Table I.
Approximate Antenna Gain in Decibels

BAND (mc)	PARABOLA DIAMETER IN FEET (Popular, Commerially Available Sizes)					
	2	4	6	8	10	15
450	—	—	17	20	22	25
960	—	—	22	25	27	30
2000	—	25	28	31	33	—
6000	30	36	40	42	44	—
12,000	35	41	45	—	—	—

Power Output

Power output of 960-mc transmitters is generally around 2.5 watts. Boosters are available which raise power by 10 db. Power output of 2000-mc band equipment is around 3 watts, except in pulse systems which produce higher peak power. For the 6000-mc band, equipment is available in 100-milliwatt and one-watt power output ratings. Equipment for the 12,000-mc band is usually rated at 100 milliwatts.

Higher-powered 6000-mc band equipment is becoming available which employs traveling wave tubes. Power output in this band is limited by the FCC to 7 watts.

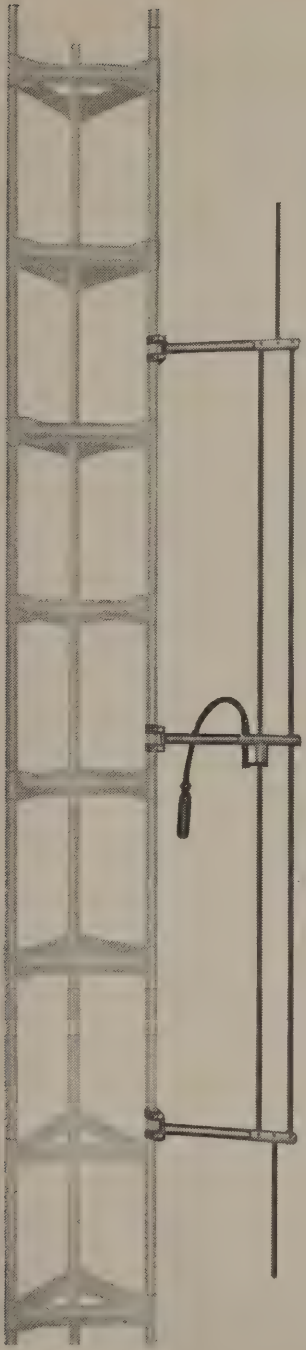
Effective radiated power can be most readily increased by employing higher gain antennas. The gains that can be realized with various sizes of antennas in the industrial microwave bands are listed in Table 1. As power gain is increased by using larger antennas, the radiated beam becomes narrower and the rigidity requirements of the towers become tighter.

Servicing

Microwave equipment should be given periodic preventive maintenance to assure maximum reliability. Preventive maintenance chores include: (1) removing dust from the equipment, (2) checking power circuits and standby power generator or battery, (3) testing tubes, (4) checking receiver performance, (5) checking tubes, (6) checking standby switching action, (7) inspecting antenna system and tower lighting, and (8) checking fault alarm functioning.

In some cases, it will be necessary to take test equipment to the microwave station being serviced. Often, a test meter is built-in, enabling the technician to measure important voltages and currents. The procedure for checking out equipment vary among manufacturers. The procedures specified in the applicable instruction book should be followed.

(Turn to page 13)



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CAT. NO. 320-509, FREQUENCY RANGE 30-54 MC*

BASE STATION SIDE-MOUNT ANTENNA

*Exact frequency must be specified

Cat. No. 320-509 Side-Mount 2.5 db Gain Antenna is designed for applications requiring an antenna which must be side mounted on existing or new towers. This antenna has essentially a cardioid pattern and has approximately 2.5 db gain in the forward direction. High strength aluminum alloy is used for all antenna parts, except the mounting clamps, which are made of stainless steel. All insulators are made of the best available materials for the various uses involved. Each antenna is supplied cut to the desired operating frequency and is assembled ready for installation.

SPECIFICATIONS

Electrical:

Nominal input impedance	**50 ohms**
VSWR	**1.5:1**
Bandwidth	**±1.0%**
Maximum power input	**500 watts**
Flexible terminal extension	**18 in. of RG-8A/U**
Termination	**Type N male with Neoprene housing**
Lightning protection	**Direct ground**

Mechanical:

Radiating element material	**6061-T6 aluminum**
Insulated support material	**Phenolic**
Feed point insulator	**Polycarbonate**
Overall length	**10 ft. at 50 Mc, 16½ ft. at 30 Mc**
Spacing from tower	**8″**
Rated wind velocity	**100 MPH**
Lateral thrust at rated wind	**45 lbs. at 30 Mc**
Weight	**15 lbs. at 30 Mc**

Stainless Steel Mounting Clamps supplied to mount antenna on round tower legs 1 in. to 1½ in. diameter.

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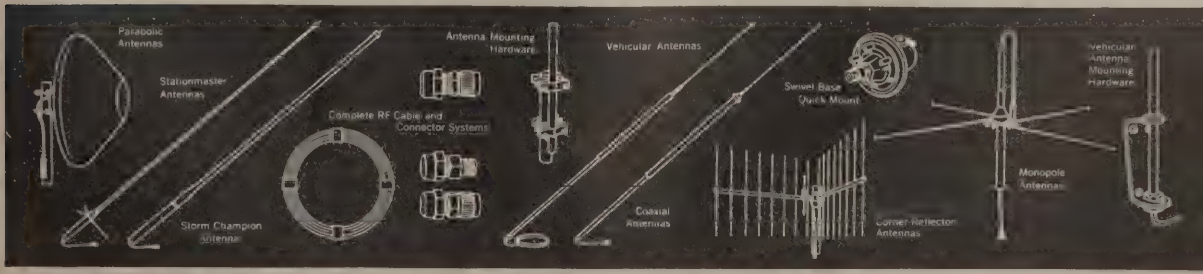


Radio-Controlled Turnpike

RADIO — IN ONE way or another — has long been one of the major tools of most police groups in the nation. These days, through, the troopers who patrol the New Jersey Turnpike are using radio in a unique way — which provides speed and relibility in alerting motorists traveling the Turnpike to vital road conditions, while at the same time increasing trooper efficiency.

The secret is a radio-controlled-warning-sign network, which provides instantaneous operation of 67 signs along the 131-mile Turnpike—all from one central location. The system is the most comprehensive of its kind in the world.

Of the 67 signs in the network, 57 are located on the north and south bound routes of the Turnpike, four on the Newark-Bay-Hudson County extension, and three on the Pennsylvania Turnpike connection. The remaining three are special signs which are used only on very windy days to ban vehicles pulling house trailers from coming on the Turnpike.

Each of the 64 roadside signs contain five basic messages — Drive Slow Ahead, Ice, Fog, Snow and Accident.

Control of the signs is achieved from the Turnpike headquarters at New Brunswick. Located there is a master control console. The dispatcher operates the control to send radio tone signals through a relay system to the individual signs. The system was built and installed by Motorola.

"Speed and dependability are the two big benefits of the new system," reports Tony Ricci, Communications Engineer for the Turnpike. "With radio, we can turn on signs in just five seconds. This means drivers can be informed of an accident only seconds after it has been reported. The speed in alerting the motorist prepares him in time to take proper precaution so he doesn't become a part of the accident.

"Radio control provides assurance that the appropriate signs and messages actually will be turned on as well," Ricci explained. "Before the system was installed, troopers had to make the rounds of the signs, individually turning them on. Naturally, when an accident occurs, the trooper goes directly to the scene first. As a result, frequently the signs do not get turned on until later. With radio, the signs are instantly illuminated and the trooper is able to go directly to the accident scene.

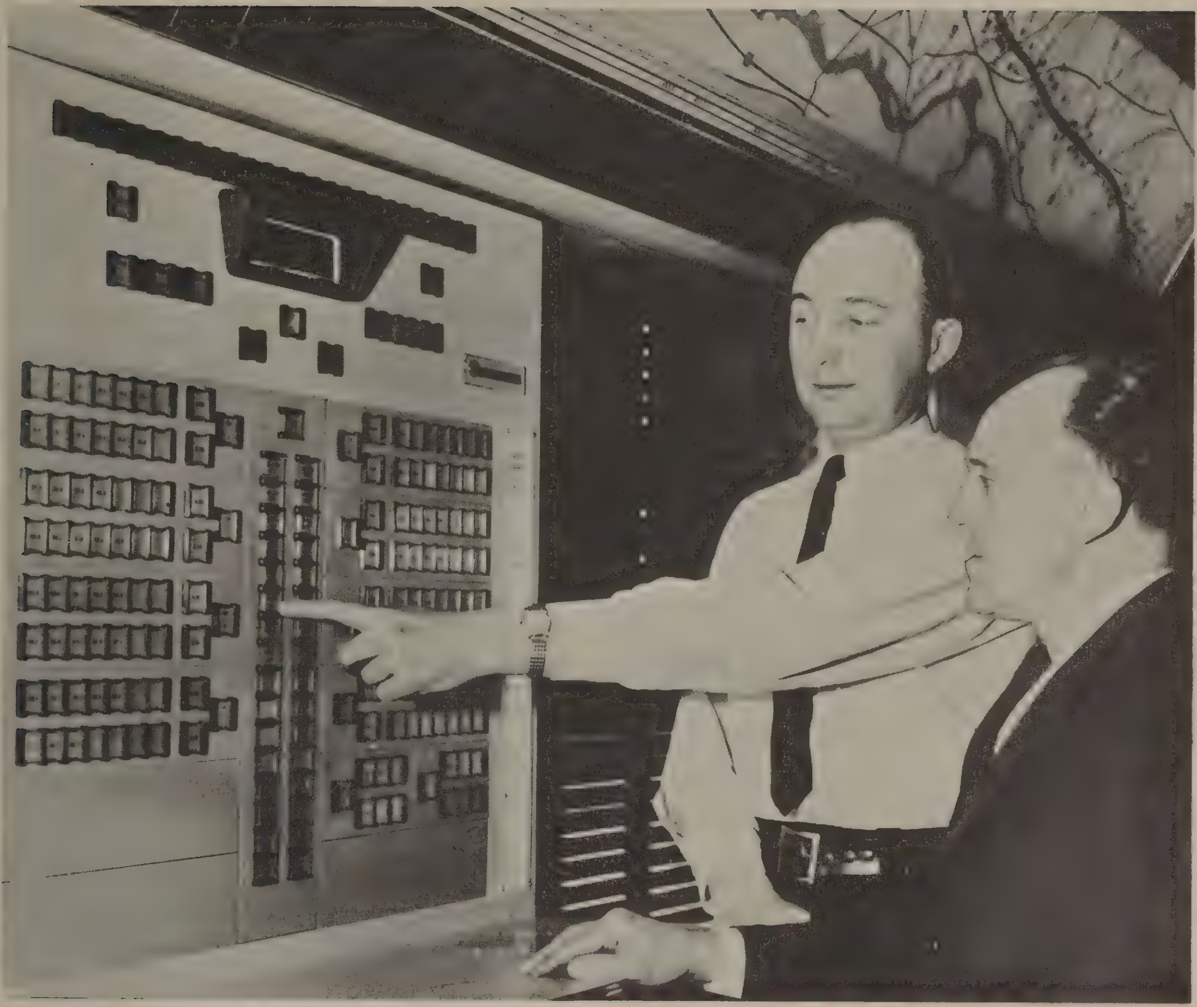
"This frees troopers to spend their valuable time patrolling instead of turning signs on and off," added Ricci. "Formerly, it could take an hour or two to turn on all the necessary signs, then go back and turn them off after the situation had changed."

Flexibility of the system enables the Turnpike to control groups of signs as well as each one individually. For example, if several miles of road were ice-covered, all signs along that stretch would be illuminated simultaneously by the dispatcher.

The radio sign control system is controlled from the Turnpike radio center at New Brunswick. Sign information is radio-relayed by one of two dispatchers who coordinate the separate mobile two-way radio systems operated by the Turnpike Patrol and Maintenance departments.

Sign control equipment at the Center consists of the control console, coder cabinet, data logger and

An example of one of the basic types of signs being radio-controlled is shown here. This sign measures 15 feet in width by 5 feet 7 inches in height. The radio antenna rises from the sign at the left. Radio receiver-decoder equipment is installed in box on first support. The second type of basic sign being used is mounted on the under part of cross-over bridges. It measures 30 feet in width and just over 2 feet in height.



Trooper Paul Hydock and Turnpike Authority Communications Engineer Tony Ricci discuss operation of control console.

an 18-foot long display map which pinpoints the status of each of the 67 illuminated signs.

The control console is made up primarily of several series of push-button type switches. The 67 signs are divided into 10 groups. Nine of these groups represent roadside signs for specific stretches of highway. The remaining group controls the three signs banning house trailers on windy days. One each of these is located at either end of the Turnpike and the third one is at the Pennsylvania extension.

Each of the nine primary groups is in turn divided into two sub-groups — one for northbound signs and the other for southbound signs.

The control console also contains two rows of buttons representing the various messages to be controlled on each sign. One row is used to turn the message or messages on, the other to turn them off.

Operation of the console is performed easily. First, the dispatcher presses the button representing the sign to be activated, then the button or buttons representing the word or words to be turned on, then the "Start" button.

To turn on all signs within one group simultaneously, the dispatcher simply presses the "Group" button, then the message buttons. The dispatcher can also turn on or off all northbound or southbound signs within the group.

The control console also contains buttons for completely testing the system and making any adjustments that may be necessary.

In a cabinet below the control console is the data logger which provides a permanent record of every sign that is controlled. It records the date, time, specific sign and wording posted and the information is automatically printed out for filing as a record.

(Turn to page 13)

Reliability in Richmond

Like most other cities the Department of Public Works in Richmond, Va., has weather problems — prolonged periods of rain during warm months and dangerous icing of streets in the winter. Inclement weather brings a need for faster and more frequent service. Cleanup crews and repair equipment have to be kept moving constantly and must be directed properly as they are needed promptly.

It's important that highway maintenance crews in Richmond have strong radio communications because a long rainy spell may mean floods in low lying areas. A heavy snow in this traditionally warm, historic capitol of the Confederacy can also cause major problems.

Two-way radio is not new to the city's DPW Bureau of Operations. The department installed its first communications for highway maintenance in 1955. When the time came for modernization of the system, Bureau Chief Louis Washer, Jr., looked for ways to overcome dead spots in transmission, to solve range difficulties, and to eliminate failures in tubed equipment.

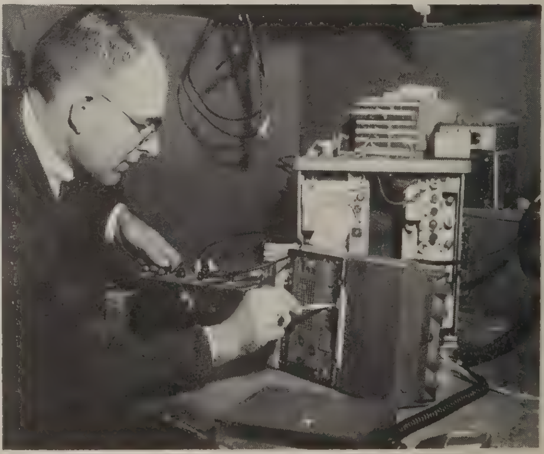
"In our type of operation," Washer points out, "radio units take a terrific beating — not only in the way our vehicles must be handled but in the wide range of temperatures we have. Constant bouncing of work vehicles doing road construction and extreme changes in weather previously had an adverse effect on our old radio equipment and loosened wiring."

The DPW decided to switch its entire set-up at once—base transmitter and 33 mobile units. A complete Transistorized mobile system was installed, using a total of 42 G-E high-band mobile units purchased under bid contract.

The extra mobile equipment allowed for expansion of the DPW system with four additional units at the time of the changeover and permitted the Department of Recreation and Parks to join the DPW's network with five radio-equipped trucks used by the parks department in looking after the city's trees.

The new system eliminated dead spots and enables vehicles to cover a greater area than previously handled. "We have clear, strong communications now," says Conway E. Regester, one of the four dispatchers who keeps the bureau radio room open on a 24-hour basis.

According to Robert M. Hall, chief radio technician for the radio maintenance department, the new G-E transistorized design has given the DPW more flexibility in switching radio equipment around. For example, as an economy measure, the department doesn't completely equip all of its vehicles. A truck assigned to route-type duties during the week might become an emergency vehicle on the weekend. In this new capacity, it would need communications. During the snow season, the department takes units out of cars over the weekend and puts them in trucks carrying salt and sand. Hall points out that the size of the new transistorized units makes it easy to switch the mobiles from one vehicle to another. As many as 10 radios are taken from unnecessary cars on weekends — or on weekdays when necessary — for use on trucks.



Richmond DPW chief radio technician Robert M. Hall checks out new transistorized equipment.

To the head of the Bureau of Operations, Mr. Washer, size is a more personal thing. A tall six-footer with long legs, he has been assigned a compact car by the city's automobile depot. He has two radio units in his car — one for communication with his own department and one to talk to the Richmond Police Department. Normally, this would create space problems but both units are front-mounted under the dash without cramping his legs and without taking passenger room.

"There is a feeling of security in your operation when your radio system is working right," Washer says. He adds: "It's good to have dependable communications without weakening your car's battery."

The new General Electric transistorized equipment draws only 0.04 ampere when on standby, with the receiver in a position to hear incoming messages. Low power consumption saves the electrical storage batteries in Richmond's highway maintenance trucks, reducing vehicular expense.

While transistorized radio equipment costs more than tubed equipment initially, Washer says it is cheaper in the long range because his department has experienced reduced cost in radio maintenance. He points to the units in his own city car, for example. Neither unit, except for a sticking switch which was corrected quickly, has had to be removed from service for repairs in the four months that he has had the equipment to date.

"With our old tubed two-way radios," he said, "we required periodic maintenance — particularly to the tubes themselves." Another advantage found in the transistorized equipment is improved frequency stability. This has given the Richmond department better communications with fewer adjustments to make to keep the set tuned properly.

Louis Washer, head of the Richmond Public Works Bureau of Operations, discusses system lay-out with Fred Christopherson, G-E district manager in Richmond.

While the dispatch point is in Public Works headquarters, the base station and antenna are located on high ground in the Carillon, a World War I memorial tower in the city's Byrd Park. A 300-watt G-E base station, the highest powered transmitter available for municipal use, is used. This is unmanned and is operated by remote control from a desk-top RC-4 console at the DPW office four miles away.

The central dispatching system is augmented by a two-way mobile repeater which permits extended mobile-to-mobile coverage. This not only increases the range of the mobile units but permits units in low-lying areas to communicate more effectively where the terrain creates obstacles to good radio coverage.

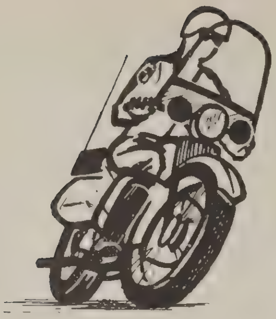
Another advantage of the repeater system is that it allows key personnel, such as Washer, to make field decisions in emergencies and to communicate directly from an emergency location to other vehicles. However, Washer believes strongly in central dispatching as a means of coordinating the bureau's routine activities and prefers that all communications go through the dispatcher to achieve more efficient administration control.

To use the mobile repeater, a car first must clear with the central dispatcher for permission to communicate directly to the other vehicles.

The system designed by the bureau's radio technicians has the ability to cut out the mobile repeater so calls originating in vehicles are not necessarily heard by all the other cars. A message transmitted from a moblie unit on 159.060 mc., for example, is heard by the dispatcher on 159.060. The dispatcher can flip a switch on his desk unit and prevent the message from being repeated automatically to the rest of the mobiles. When the repeater operation is desired, the message is re-transmitted instantly from the base location on 150.995 mc. and received by the other mobiles on 150.995.

With the repaeter system and high-powered 80-watt G-E Transistorized Progress Line units, the Richmond DPW is equipped to handle calls in outlying areas where communications would have been limited with the city's old 20-watt equipment.

The power of the new system, the repeater operation, the economy benefits of transistorization and the compactness of the mobiles have all combined to give the bureau the most reliable communications it has ever had, officials declare. ■



PUBLIC SAFETY COMMUNICATIONS

by Robert E. Brooking, Communications Engineer — City of Burbank, California

It seems that for some of us, there just are not enough hours in the day (or days in the week) to do all those things that we should like to do. The editor of this column is no exception. An invitation to yours truly, extended way back B. C. H. (Before Communication Horizons) by Mr. Harvey O. Platt, Director of Communications, Riverside County, California, was accepted, but somehow the date kept getting postponed.

Harvey explained that the invitation was made in connection with a tour of the communications facilities of Riverside County and would require two days. Since the majority of the mileage to be covered was in desert areas, where the summer temperatures reach 130°, with the arrival of June, 1961, the trip was further postponed. However, a couple of months ago, Harvey and I both finally found the necessary time for the trip.

The County of Riverside includes a geographical area of approximately 7200 square miles. By way of comparison the States of Connecticut and Rhode Island together have a geographical area of about 6000 square miles. Their shape is also very comparable. From the eastern border adjoining Arizone at the Colorado River, the County extends west approximately 200 miles to a point just seven miles from the Pacific Ocean.

Between hese two points there exists extremes of topography and climate. In the western portion of the county there are several fertile valleys separated by low mountain ranges. The cities of Riverside, Corona, Elsinore, Perris, Hemet and San Jacinto are situated in these valleys, which enjoy a semi-arid, sub-tropical climate.

To the east are the San Jacinto Mountains, varying in height from 5000 to 10,800 feet. To the north of this range is the Banning, Beaumont Pass area with an elevation of 2667 feet. This is the area famous for cherry orchards. To the east of these mountains, which are snow capped several months each year, lies the Coachella Valley; a desert area dropping to 240 feet below sea level at the Salton Sea. Here are located the famous date gardens of Indio; but it is better known as one of the foremost winter resort areas in the United States.

At the northwest corner of this valley lies Palm Springs, elevation 455 feet. Seven and one half miles west stands Mount San Jacinto, 10,805 feet. Such an abrupt change in elevation is unequaled anywhere in the Rocky Mountains or even the Sierra Nevada. When the aerial tramway is completed, it will be possible to go skiing on a January morning and swiming the same afternoon in an outdoor pool. Forty miles to the southeast, the Salton Sea Shore is rising swiftly to prominnence as a winter resort area. Temperatures here are ideal for water sports during the winter months.

Another range of mountains, the Chuckwallas, separate this desert valley from the Palo Verde Valley area along the Colorado River. The City of Blythe is the trade center and Port of Entry into California for US 60 & 70. This highway runs for more than 150 miles through the County and carries more traffic into California than any other road.

Like many other governmental entities, the first radio system in the County was used for law enforcement purposes with amplitude modulated, medium frequency base stations.

The cars transmitted on 30.58 mc also AM. The base stations, located at the Sheriff's Headquarters and Substations, transmitted on 2442 kc using Hertz antennas. The ground plane antennas for receiving the 30.58 mc mobile transmissions were mounted on top of poles. Coverage was ten to fifteen miles, although signals from the eastern states often over-rode the local mobiles. Riverside and Blythe handled point to point traffic on 2442 kc but the frequency was subject to fades, atmospherics, and interference from other users. The entire system left much to be desired.

World War II proved not only that frequency modulation was a better system for mobile radio work, but also that V.H.F. particularly between 100 and 160 mc was superior in many respects to the frequencies below 50 mc. It was less affected by interference, either man made or atmospheric; but more important it was not subject to ionospheric (skip) interference.

With the close of World War II, Harvey realized that the time had come to move the system to VHF. A frequency of 158.85 mc was approved and by 1951 the law enforcement system was established on that frequency. This solved he interference problems, particularly skip.

However, the coverage was inadequate in a number of areas because of the vast distances involved. The existing Box Springs Mountain site, five miles southeast of the City of Riverside and 1800 feet higher gave excellent coverage of the western end of the County but the vast desert areas could not be adequately covered from the existing facilities at the Sheriff's Substations.

Harvey did a survey of the County to find suitable sites for the VHF radio stations. He selected four: Mt. David near Beaumont; Whitewater (7 miles norhwest of Palm Springs;) Cactus City (15 miles east of Indio) and Black Rock (9 miles west of Blythe).

This still left one big problem control and voice circuits between the control points and the mountain top sites. To provide these circuits microwave links were established between Mt. David and Banning, Banning and Whitewater, and Indio and Cactus City. A similiar installation was planned for Black Rock. At Box Springs Mountain microwave was set up to add a number of circuits into Riverside because of new radio systems being intalled.

By adding a link between Box Springs and Mt. David and also Whitewater and Indio, it was pos-

Turn to Page 14

RADIO-CONTROLLED TURNPIKE . . . from page 9

Once the dispatcher presses the appropriate buttons, coded tone signals are transmitted to the specific sign of groups of signs. The system includes five 60-watt base repeater receiver-transmitters, insalled along the Turnpike, north to south, at Secaucus, New Brunswick, Bordentown, Mooretown and Swedesboro.

The tone coded signals are carried by microwave radio to the repeater station nearest the sign. There, the signals are received and rebroadcast to a receiver-decoder unit at the sign. The signals are received, decoded and converted to relay contact closures which provide voltages to illuminate the specific message. Backstop operation is available by selecting an alternate repeater station in the event of a failure of the primary repeater. The same five base stations are used to provide two-way radio communication for the Turnpike's Maintenance Department.

Future expansion capabilities were built right into the sign control network. An approximate 100 percent increase in both the number of signs that can be controlled and the number of mesages provided by each sign is possible. ■

MICROWAVE SERVICING . . . from page 6

Tube failures are perhaps the most common source of troubles. By checking the tubes frequently and logging the condition of each tube, the technician will get an indication of when certain tubes approach replacement time. Since an old tube is apt to be more reliable than an un-aged new one, tubes should not be replaced merely on the basis of hours of service.

Klystrons are known for their long life. When a klystron is replaced, the new one may not be satisfactory if it has been stored unused for a long time. They are subject to shelf deterioration. Hence, bargain surplus klystrons may not be a bargain after all.

Component failures are apt to occur more frequently if the equipment is not adequately ventilaed. Since the equipment is ordinarily operated continuously, the temperature rise in the face of inadequate ventilation can be excessive.

Misalignment of antennas and passive reflectors is an infrequent cause of excessive fading. If the antenna is inadvertently aligned to favor a lobe instead of the main beam, a considerable transmission loss may occur.

It should now be obvious that microwave equipment is not complicated. Aside from the use of waveguides, ferrite isolators and klystrons, the circuits and components are straight forward.

The RF equipment is only a part of a microwave system. Multiplex equipment for deriving voice, data and telegraph channels, as well as fault alarm equipment, will be discussed in Part Two of this article. ■

Veteran Executives to Review Cases

FCC Names Board

AN FCC Review Board which will take original action on a number of matters previously acted upon by the Commission, the Motions Commissioner, or the Chief Hearing Examiner, as well as reviewing exceptions to initial dcisions in six categories of cases, has been established effective August 1.

The board, composed of four long-time Commission exevutives, was appointed in accordance with provisions of the FCC Reorganization Act passed a year ago.

Members of the board are Donald J. Berkemeyer, chairman; Dee W. Pincock; Joseph N Nelson; and Horace E. Slone.

The board will have original jurisdiction over 10 categories of cases, as well as over all pleadings filed in cases or matters already before the board.

The categories are:

1) Petitions to amend, modify, enlarge, or delete issues upon which the hearing was ordered;

2) Petitions to intervene;

3) Requests for leave to file additional pleadings (provided for in Section 1.13 of the Commission's rules);

4) Petitions by adverse parties requesting dismissal of an application;

5) Joint requests for approval of agreements;

6) Petitions for waiver of requirements of FCC rules specifying time, place, or manner of giving local notice;

7) Dismissal of applications with prejudice for failure to comply with local-notice requirements;

8) Dismissal of cease-and-desist, suspension, and revocation proceedings;

9) Petitions for acceptance of late written appearances and statements; and

10) Termination of hearing proceedings.

The review board will act on all appeals from interlocutory ruling of the hearing examiners. In addition, exceptions to initial decisions in matters concerning AM and FM broadcasting (with three specific exceptions). TV translators, proceedings on applications of communications common carriers, proceedings involving complaints against communications common carriers for recovery of overcharges, safety and special radio services proceedings, and proceedings involving suspension of operator licenses and permits will be reviewed by the board.

All members of the board have been with the FCC for more than 15 years. Chairman Berkemeyer joined the Commission in 1946 as an attorney, and for the past four years has been chief of the office of opinions and review.

Pincock also joined the FCC as an attorney in 1946, and has been assistant general counsel in charge of the regulatory division since 1959.

Nelson, chief of the renewal and transfer division of the Broadcast bureau since 1956, has been with the Commission 16 years and is a former chief of the Television branch, Broadcast bureau.

Slone, the senior member of the board in terms of FCC experience, joined the commission in 1940 as an assistant monitoring officer and inspector. Since 1957, he has been engineering assistant to Commissioner Bartley.

PUBLIC SAFETY . . . from page 13

sible to provide a point-to-point law-enforcement dispatchers telephone circuit from Riverside to Banning to Indio via microwave. To this system was added a link at Chuckwalla Mountain extending the microwave system to Black Rock and Blythe.

The first result was to provide a law enforcement telephone circuit from the Riverside Sheriff's Office to various substations including Blythe. This replaced the use of 2442 kc with a reliable 24-hour-a-day circuit. A second circuit was turned over to the County Direcor of Civil Defense offices in various parts of the County.

When Harvey planned the basic system he chose RCA-2000 mc microwave equipment with Stromberg-Carlson stackable single-sideband carrier telephone equipment for multiplexing. Each channel

Turn to Page 18

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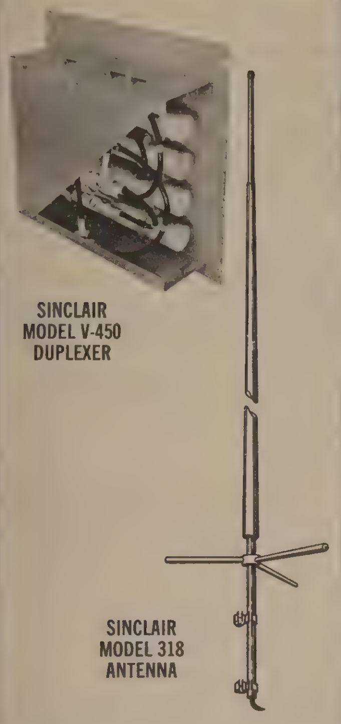

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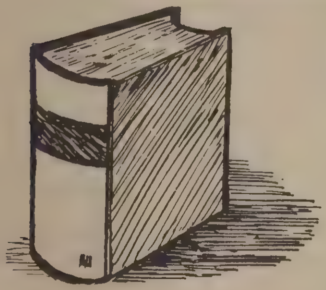


LOGBOOK

A CALENDER OF IMPORTANT MEETINGS AND EVENTS OF INTEREST TO MOBILE COMMUNICATIONS.

At press time, Washington Bureau Chief Bob Tall was in hospital recovering from an emergency appendectomy. As a result, this month's Logbook is incomplete. Next month's will be back on schedule — and we join all the readers in wishing Bob a speedy recovery!

June 19-22—Annual meeting of National Committee for Utilities Radio. Claremont Hotel. Berkeley, California.

July 1—Date to start sending Class B, C or D citizens radio applications to FCC office at 334 York St., Gettysburg, Pa., instead of Washington.

July 17-20—Annual Conference of Forestry, Conservation Communications Association. Eastland Motor Hotel. Portland, Me.

Aug. 1—Comments due on FCC proposals to service-allocate split channels in the 25-42 mc mobile radio band.

Aug. 7-10—National conference of Associated Public-Safety Communication Officers. Harrison Hotel, Clearwater, Fla.

Aug. 21-24—Western Electronics Show and Convention, Ambassador Hotel and Memorial Sports Arena, Los Angeles.

Sept. 17-19—Annual convention of National Mobile Radio System. Statler Hilton. Washington, D.C.

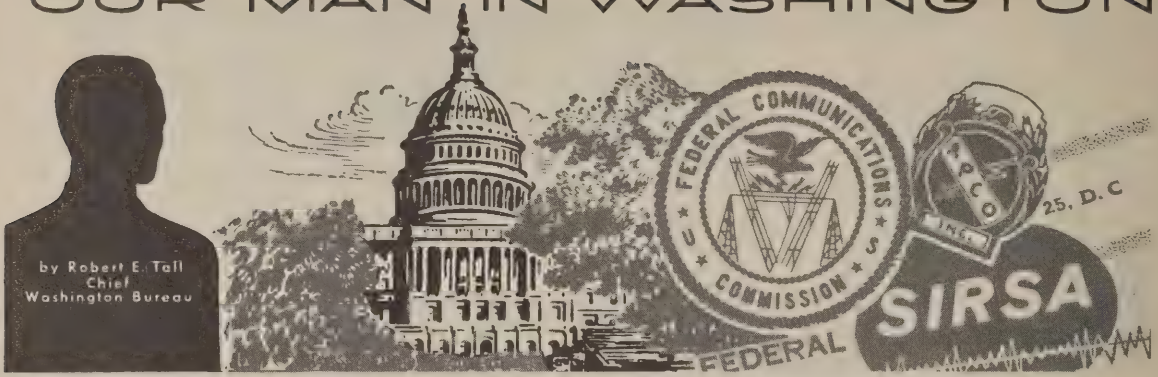
Sept. 23-26—Annual conference of International Municipal Signal Association. Queen Elizabeth Hotel. Montreal.

Oct. 1—FCC oral argument on request of State of Colorado for waiver of police rules to permit police radio system to continue to transmit non-ploice public safety messages. To be held in Denver.

Oct. 23-25—Annual meeting of Communications & Signal Section of Association of American Railroads. Sheraton-Chicago Hotel. Chicago, Ill.

Jan 1, 1963—Date when new revised FCC Form 505 must be used for Class B, C or D Citizens radio applications.

OUR MAN IN WASHINGTON



by Robert E. Tall
Chief
Washington Bureau

Fee Opposition Unanimous

Of the 800-plus comments received by the FCC regarding its proposal to charge fees for licenses, all were opposed to the proposal as written—and only a few failed to oppose the entire idea of "filing fees."

Among those few were the National Mobile Radio System and the EIA's Land Mobile Communications Section. The NRMS comment was possibly the closest of any to outright endorsement of the "filing fee" concept, in saying the organization "does not object to the esstablishment of filing fees per se, provided tangible benefits accure from the payment of such fees and provided such fees are established on an equitable basis."

The EIA comment noted that while Safety & Special Radio Services fees would amount to nearly two-thirds of the total fee income, this bureau receives only 30 percent of the Commission's annual budget.

APCO commented primarily on the application of fees to Public Safety licensees, opposing this completely.

Possibly the longest comment received was the 20-page document of SIRSA, in opposition to the entire principle of "filing fees."

Flea-Power Rule Asked

The NAM Committee on Manufacturers Radio Use has petitioned the FCC for frequency assignments in the 72-76 mc region for use by "flea-power" portable two-way equipment carried by workers in dangerous operations where split-second timing is necessary to prevent injury or death.

CMRU cited examples of such possible use as between two or more workers engaged in pouring hot steel, maneuvering giant cranes, loading and unloading barges, and emergency work at night. The "flea-power" equipment would replace the present techniques of relaying information by means of hand signals from a third party.

NMRS Supports Waco Request

The National Mobile Radio System notified the FCC of its "wholehearted support" for the petition of Waco Communciations, Inc., which asked amendment of domestic public land mobile radio rules to permit establishment of satellite base stations without requiring local control points for those stations.

NMRS pointed out that the situation is typical throughout the west and southwest, and said such a change would permit "extended" service to RCC subscribers.

Developmental Alarm Net OKed

A developmental authorization to test feasibility of 952-960 mc intruder-and-fire alarm services has been granted to Central Watch Service, Chicago.

The system, to be used within a 30-mile radius of the firm's Chicago office, will test both directional and non-directional antennas. The grant is in line with an FCC decision making provision for such authorizations.

Locomotive Control Permit Granted

A new type of radio usage—remote control of a railroad locomotive by radio from a crewman alongside the track—saw its third licensee with grant of such a license to the Kentucky Power Company.

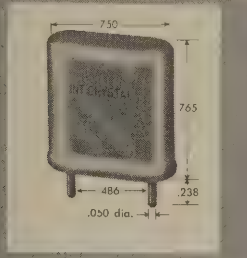
Earlier licensees for this use of radio were Arizona Public Service Co. and U. S. Seel Communications. Such usage permits a lone crewman to completely control railway switching operations.

Only a limited number of such grants are anticipated pending reports from all users.

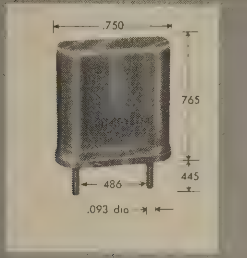
Microwave Rule Change Asked

The National Committee for Utilities Radio has petitioned the FCC to initiate rule making proceedings to relieve power radio service licensees of the mandatory use of frequencies above 10kMc for portions of microwave systems which may be of "a local nature."

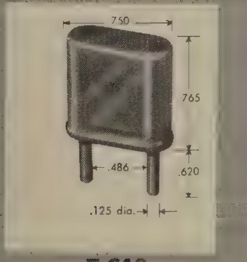
Custom made CRYSTALS



F-605



F-609



F-612

FREQUENCIES 70 KC TO 137 MC

DESCRIPTION AND DATA:

All of these crystals are of the plated, wire-mounted type. Low drift AT-cut blanks are used in these units above 500 KC, and low drift DT and CT-cut blanks are used in units below 500 KC; any crystal can be supplied for operation with or without an oven.

TEMPERATURE TOLERANCE:
AT—±.005% from —55° to +90°C.
±.002% from —30° to +60°C.
DT-CT—±.01% from —40° to +70°C.

CALIBRATION TOLERANCE:
Supplied to meet equipment manufacturers speifications and may be as close as .001% without oven or .0005% with oven. Where no equipment is specified the following will apply.
AT— .0025% of nominal at +30°C.
DT-CT— ,01% of nominal at +30°C.

DRIVE LEVELS:
Maximum, AT—
10 milliwatts 500 KC to 999 KC
4 milliwatts 10,000 KC to 24,000 KC
2 milliwatts 25 MC to 137 MC
DT-CT—2 milliwatts

CIRCUIT: As specified by customer. Crystals are available for all major two-way equipment and in most cases the necessary correlation data is on file. Where circuit is not specified, the crystal will be calibrated for operation into a load capacitance of 32 mmf.

FREQUENCY RANGES AND MODES OF OPERATION

200-500 KC:
Operates on fundamental edge shear oscillation. Load capacitance 32 mmf . . . or as specified by customer. If load is not known specify circuit or equipment in which crystal will be used.

500-20,000 KC:
Operates on fundamental face shear oscillation. Load capacitance 32 mmf . . . or as specified by customer.

10-60 MC:
Operates on third mechanical overtone at anti-resonance. Will give reasonable output in tuned circuit.

60-100 MC:
Operates on fifth (or seventh) mechanical overtone at series-resonance. Drive level must be kept below 2 milliwatts.

ONE DAY SERVICE

Orders for less than five crystals are shipped within one working day following receipt of order (except low frequency and special crystals which require 10 to 30 days for processing). Orders received on Mon. thru Thurs. will be shipped the day following. Orders received on Fri. will be shipped the following Mon. Postage is prepaid within continental U.S. when cash accompanies order. All others are shipped F.O.B. Oklahoma City.

SUPPLY THIS INFORMATION WHEN ORDERING

MOTOROLA: Crystals can only be properly correlated for Motorola equipment if the crystal type number is given. Example: D02, R28, D03, etc. In cases where crystals are required for type D-14, 800 and 801 holders, always specify crystal frequency or the high IF frequency. Check whether the crystals are to be used in ovens.

GENERAL ELECTRIC: Specify model number of transmitter and receiver RF Decks. Example: 4ES13A3, 4ER24B1, 4ET5B3, etc. When ordering crystals for 450 MC equipment specify:

Receiver Crystals:
A. If they are heated or non-heated.
B. If the unit is AFC or NON-AFC Controlled.
C. Platter number of present receiver deck.

Transmitter Crystals:
A. If they are heated or non-heated.

R.C.A.: Specify model number of unit or MI Number of the crystal. Always indicate whether crystals are to be non-heated or heated type.

OTHERS: Specify model number of the receiver and transmitter as well as any formulae that pertain to the correct crystal calculation.

PRICES — F-605, F-609, F-612 CRYSTALS

Fundamental KC		Fundamental KC		Overtone MC	
200 - 499*	$12.50	3000 - 3999	$5.75	10 - 34.99	$ 6.50
500 - 849*	15.00	4000 - 5999	5.00	35 - 44.99	7.00
850 - 899*	13.50	6000 - 9499	4.50	45 - 60	8.50
900 - 999*	12.50	9500 - 10999	5.00	61 - 75	10.50
1000 - 1499†	9.80	11000 - 14999	6.30	76 - 137	15.00
1500 - 1999†	7.50	15000 - 20000	8.00		
2000 - 2999	6.50				

*Allow 10 to 30 days for processing. †Allow 2 to 3 days for processing.

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Specifically, the NCUR charged that present rules require establishment of two separate systems in certain cases, and asked that this requirement be removed.

Hearing Holiday Set

Following its usual practice, the FCC will have no hearings or oral arguments during the month of August. Different commissioners will be available through the month, however, to handle emergencies and to expedite "routine business."

Small Forfeitures Effective

The small-forfeitures bill, requested by the FCC as its top-priority legislation of this year, became effective June 10. However, no prosecutions of violations prior to that date are anticipated. See last month's CH for full details of the measure.

Emergency Service Redefined

Eligibility provisions for the automobile emergency radio service have been broadened to include *any* person engaged in providing any form of emergency road service to the general public.

In addition, the service was redefined as "a radio communication service for use in connection with the dispatching of emergency road service vehicles for the purpose of assisting disabled automotive vehicles on streets or highways."

The broadened eligibility now makes it possible for service stations as well as public garages to qualify for licensing in this service.

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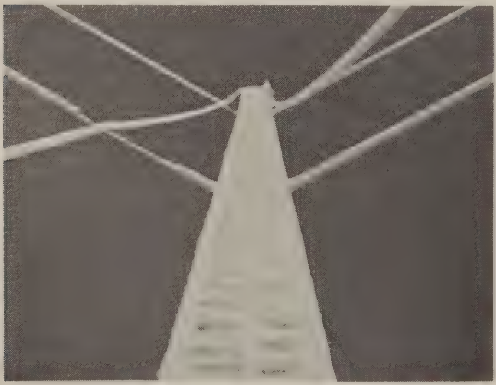

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New Aviation Service Proposed

A new class of aviation radio station, for use in connection with such activities as parachute jumping, forest-fire fighting, and other ground-to-air and air-to-air operations not now allowed for, has been proposed by the FCC in a rulemaking move.

The proposal contemplates use of the spot frequency 112.9 mc for the new service; this frequency was picked since most aircraft already have capability of operation here.

The FAA has already commented that there is "a pressing need" for such a service, and urged immediate action. Other comments are invited before the June 26 deadline.

Industrial Rule Amended

The FCC has completed action on an earlier rule proposal reducing allowable frequency tolerance in the industrial radio services from 0.01 percent to 0.005 percent. The new rule applies to transmitters operating below 25 mc, at more than 300 watts input power. The rule change brings FCC regulations into line with the 1959 Geneva radio regulations on this point.

Public Safety . . . from page 14

was supplied with a signalling circuit as well as the voice circuit. This signalling circuit could be used for dialing or for actuating a radio transmitter. A basic ten-channel allocation uses a frequency assignment of 4 to 44 kc. An additional ten channels are obtained by using the same basic frequencies and converting to the lower side-band of a 96 kc carrier. A third set of ten channels is derived in the same fashion but using the upper side-band of the same 96 kc carrier.

Harvey's sysem has continued to expand. At present installation of circuits for the County Road Department are being completed. These circuits, in connection with a duplex channel VHF radio system, will make it possible for any Road Department vehicle to talk to any other Road Department vehicle anywhere in the County. A coordinated Local Government system will follow, for use by the Agriculture and other Departments. (Speaking of Agriculture, 101 different crops are grown in the County and in 1961 their wholesale value reached 161 million dollars.)

Additional microwave links are adding more cities to the system and a number of channels have

(Turn to page 20)

CH SHOWCASE

Selective Calling Device

A selective-calling device offering 37 different tone signals was unveiled at the May parts show in Chicago by *E. F. Johnson Co.,* of Waseca, Minn.

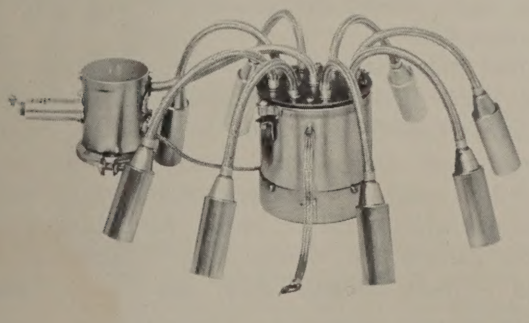
Attachable to any make or model of unit, the Johnson "Tone Alert" is operated by an audio tone. When the proper tone is received, the radio's audio is made operative and a bulb lights to indicate that a call was received.

Cost of the "Tone Alert" is quoted at $59.95 each.

Ignition Noise Shield

A comprehensive mechanical ignition shielding system designed to protect mobile-radio users from ignition noise and interference has been introduced by the *Hallett Manufacturing Company,* Los Angeles.

Called "The Signal Saver", the new device is said to blank both conducted and radiated noise. Features include snap-on plug shields, aircraft-quality cables, a new type of shielded distributor cap, and a coil enclosure.



The device is adaptable to automotive, industrial, and marine installations, and may be specified as original equipment from engine manufacturers.

For full specifications and literature, write to Hallett at 5910 Bowcroft, Los Angeles, Calif.

Monitor Receivers

A new line of base station monitor receivers has been announced by *The Hallicrafters Co.* Three units comprise the line; they cover low-band FM, high-band FM, and aircraft band AM.

The CR-1 is a narrow-band, triple-conversion unit for the 30-50 mc range. Model CRX-2 is similar but covers 151-174 mc. The CRX-3 is a dual-conversion AM receiver covering 180-135 mc for aircraft monitoring.

For additional details, write Hallicrafters at 4401 West 5th Avenue, Chicago 24, Ill., and tell them you saw it in CH Showcase.

GE Adds 80-Watt High-Band Unit

A heavy-duty 80-watt high-band base station unit has been added to the Progress Line by *General Electric.*

Operating in the 130-174 mc range, the new unit is available in floor-type cabinets as well as weather-proofed cabinets for indoor or outdoor use.

For further information, write Section P, General Electric Communication Products Department, P. O. Box 4197, Lynchburg, Va.

High-Power, Low Loss Coax

A flexible, low-loss coaxial cable capable of handling up to 2000 watts of RF at 450 mc, yet requiring no pressurization, has just been announced by *Andrew Corporation.* P. O. Box 807, Chicago 42, Ill.

The new cable, Foam HELIAX, has a characteristic impedance of 50 ohms and is available in ½-inch and ⅞-inch size. The ½-inch size handles 800 watts at 450 mc., with 1.95 db/100 ft. loss at this frequency; the larger size handles a full 2000 watts in the UHF region with only 1.2 db/100 ft. loss.

For complete information, write Andrew and ask for Bulletin 8484A. Tell them where you saw it.

6 KMC Relay Antenna

A dual polarized microwave relay antenna for use in the 6-7 kMc region has been announced by *Gabriel Electronics,* Millis, Mass.

Designated as Model DPC-1, the new antenna is designed for simultaneous operation on both vertical and horizontal polarization.

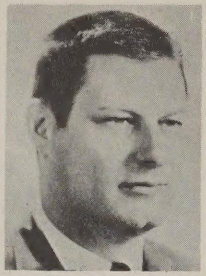
Full details on the DPC-1, which is available in 4-foot to 10-foot diameters, are contained in Data Sheet No. 119, free on request from Gabriel.

MILESTONES

PEOPLE, PLACES, AND THINGS
IN THE NEWS

PEOPLE stole the spotlight this month; all over the industry, executives were moving from one desk to another.

Joseph J. Sedik was named to the new post of marketing manager for Gabriel Electronics, Millis, Mass. He came to Gabriel from Raytheon's Norwood, Mass., facility, where he was manager of Microwave Systems Engineering.



Joseph J. Sedik

Jack M. Gutzeit, W2LZX, a long-time electronics industry figure, joined Sonar Radio Corp., Brooklyn, as national sales manager.

Don Cinalia became assistant sales manager of Jerrold Electronics Corporation's Industrial Products Division, moving from Filtron Co., Inc., Flushing, N. Y.

Stanley E. Harter was named communications officer of the state of Hawaii's civil defense division, to replace M. J. Brown, who retired.

Ward Montgomery was appointed marketing manager of hospital communications products by Motorola; he has been with Motorola since 1951.

And also in Chicago, Robert J. Orwin was promoted to technical director of the commercial products division at Hallicrafters.

Not a job changer, but still a "people in the news," was Col. Webster F. "Web" Soules, OEM military and aircraft sales manager for Electro-Voice. He was awarded a certificate of merit by Michigan's Gov. Swanson for his leadership of the Michigan chapter of MARS (Military Affiliate Radio System).

Top PLACE on the list was Disneyland — site of the 13th National Technical Conference of the Professional Group of Vehicular Communications of the IRE.

This conference, to be held December 6 and 7, will feature exhibits of the latest mobile radio, microwave, and base station gear.

Anyone desiring to submit papers for this conference should contact William Weiss, Motorola C&E Inc., 4501 Augusta Blvd., Chicago 51, Ill.

Hitting the expansion trail was the New England district sales office of Raytheon's Semiconductor Division. They moved from Newton, Mass., to 411 Providence Turnpike, Westwood, Mass., to handle increasing sales volume. Now under study is establishment of a branch office in southern Connecticut.

THINGS featured were all large sales and systems.

Aeronautical Electronics, Inc., manufacturers of the Aerotron line, landed orders for more than 1,000 units from South America. One order alone was for 990 mobile units and 10 base stations.

General Electric announced receipt of a contract to supply 96 mobile units, three base stations, and eight remote control units to the City of Dayton, Ohio.

And Motorola announced three new systems: the largest included 325 mobile units and 50 "Handie-Talkie" units for the Chicago Police Department. An Indiana state-wide network provided an order for 90 more mobiles and six base stations, while a railway system for Central Vermont Railway, Inc., accounted for 32 Motrac units and 54 more "Handie-Talkie" sets.

PUBLIC SAFETY . . . from page 18

been placed in still another service. By means of the dialing capability of the carrier equipment a dial telephone system has been developed using North Electric automatic exchanges.

Thus the County Offices at Blythe, Indio, Banning, Hemet and Riverside are all in the same building as far as being able to communicate; just dial four numbers and "there you are". At present there are three trunks to Blythe, four to Indio, two to Banning and two to Hemet. Over 15,000 telephone calls each month between these points are being handled and the need for additional circuits is now apparent.

Thus what was born of necessity, to provide a reliable law enforcement communications system for Riverside County, has today grown into one of the most versatile county-owned communication systems in the entire country.

on other horizons this month:

You know, there's just a chance you might *not* know that we here at Horizons publish a number of other electronics specialty magazines. Just as COMMUNICATION HORIZONS covers the entire field of non-broadcast communuications (including microwave, now), our other magazines provide complete coverage of the fast-growing CB radio industry, the highly-specialized Community Antenna TV area, and the history-making VHF/UHF ham radio field. Here's what's appearing in the current issue of each of our other magazines on other horizons:

CB HORIZONS

In the 60 fact-filled pages of CBH's July issue (now on sale) you'll find a first-hand report of the Chicago parts show, details of South American and Canadian versions of the Citizens Radio Service, and construction articles on a new type of noise blanker, an RF power meter designed especially for CB, and a miniaturized base-station antenna. Regular features include late news from Washington, the Showcase of new products, and lab tests on the most interesting late equipment releases.

tv

Television Horizons, in its 28 large pages, contains details of "engineering in" public relations for a CATV system; a new Yagi antenna design; an exclusive report of the New York City UHF test; engineering details of a transistorized CATV system; and a description of the world's largest CATV system (in Wilmington, North Carolina). Regular features include general industry news; reports of new equipment, acquisitions, and trends; and late word from our European correspondent.

VHF HORIZONS

Making its bow this month is VHF Horizons; the 40 pages of Vol. 1, No. 1 tell VHF-minded hams how to find OSCAR (the orbiting ham satellite), describe construction details of two 50-mc beam antennas, show how to build two high-performance converters, discuss feedline efficiency, and introduce a new method of amplitude modulation for low-powered equipment. In addition, there's late news of VHF activity the world over, ham happenings in Washington, lab reports, and the showcase.

It's been our experience that many readers of one of our magazines also have special interests in a field covered by another Horizons publication — yet don't know that the other magazines exist. If you would like a sample copy of the latest issue of any of these publications, together with either subscription or advertising data, just fill out the card between pages 14 and 15 and airmail it today to

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